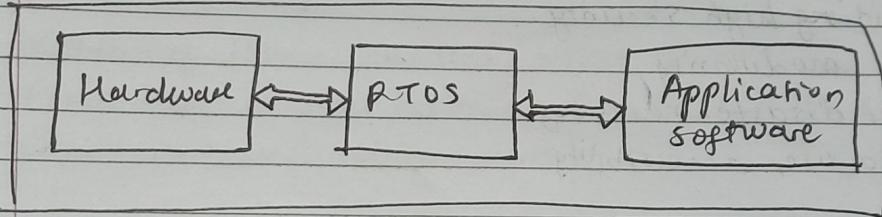
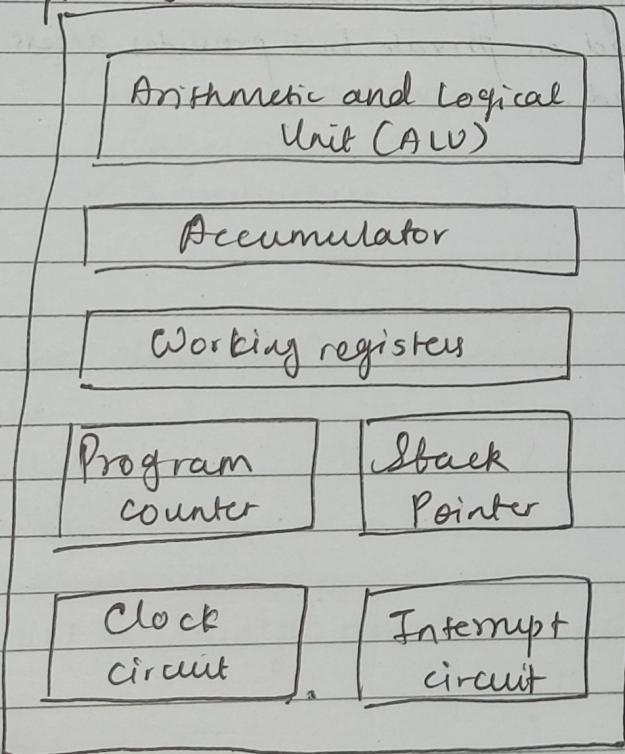


Important Things from END SEM POV.

1. Embedded system.



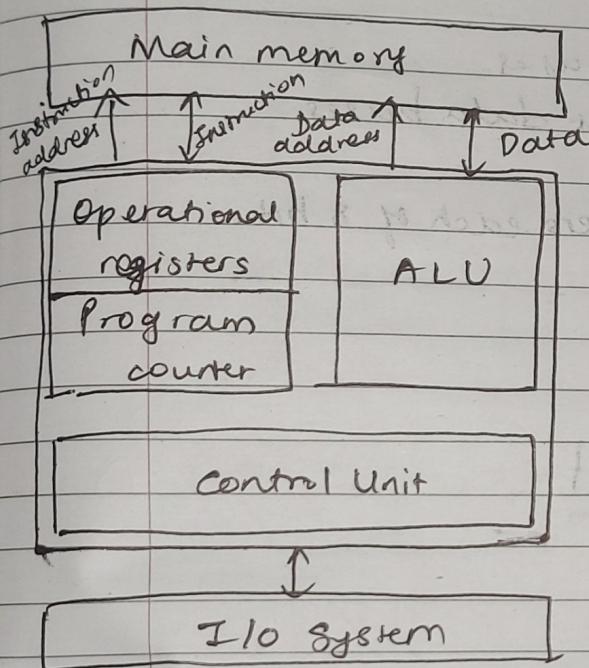
Microprocessor



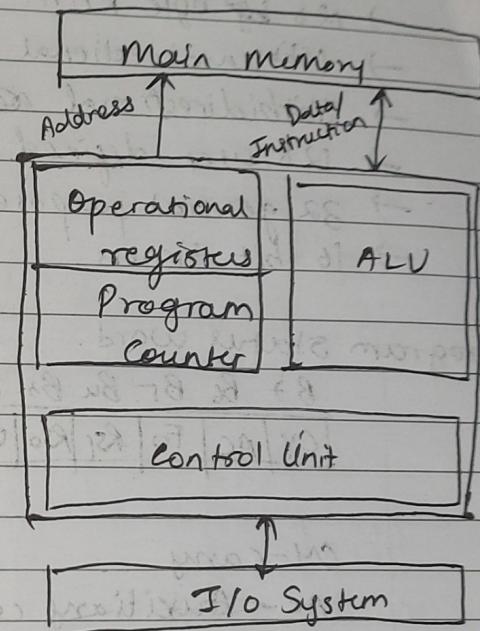
Microprocessor: Central processing unit ~~base~~ built onto a single VLSI chip

Microcontroller: A microcomputer made on a single semiconductor chip. It is used in various control applications, called microcontroller.

Harvard archi



Von-neumann archi



8051 - Microcontroller

- Intel
- Embedded C
- Harvard archi

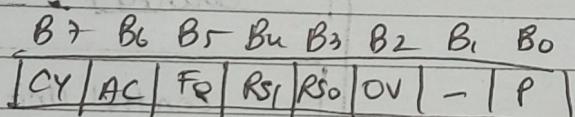
Register banks of 8051

	R2	F	R7	17	R2	1F	R7
7	R6	E	R0	16	R6	1E	R0
6	R5	D	R5	15	R5	1D	R5
5	R4	C	R4	14	R4	1C	R4
4	R3	B	R3	13	R3	1B	R3
3	R2	A	R2	12	R2	1A	R2
2	R1	9	R1	11	R1	19	R1
1	R0	8	R0	10	R0	18	R0

Registers - $8 \times 4 = 32$ general-purpose regis.

- 4 register banks
- 4K Byte ROM
- 128 8bit byte RAM
- 16bit unidirectional address buses
- 8bit bidirectional address and data buses
- 128 user defined flag
- 32 general purpose registers each of 8 bit.
- 16 bit timers

Program status word.



CY - carry

AC - Auxiliary carry

F₀ - User defined

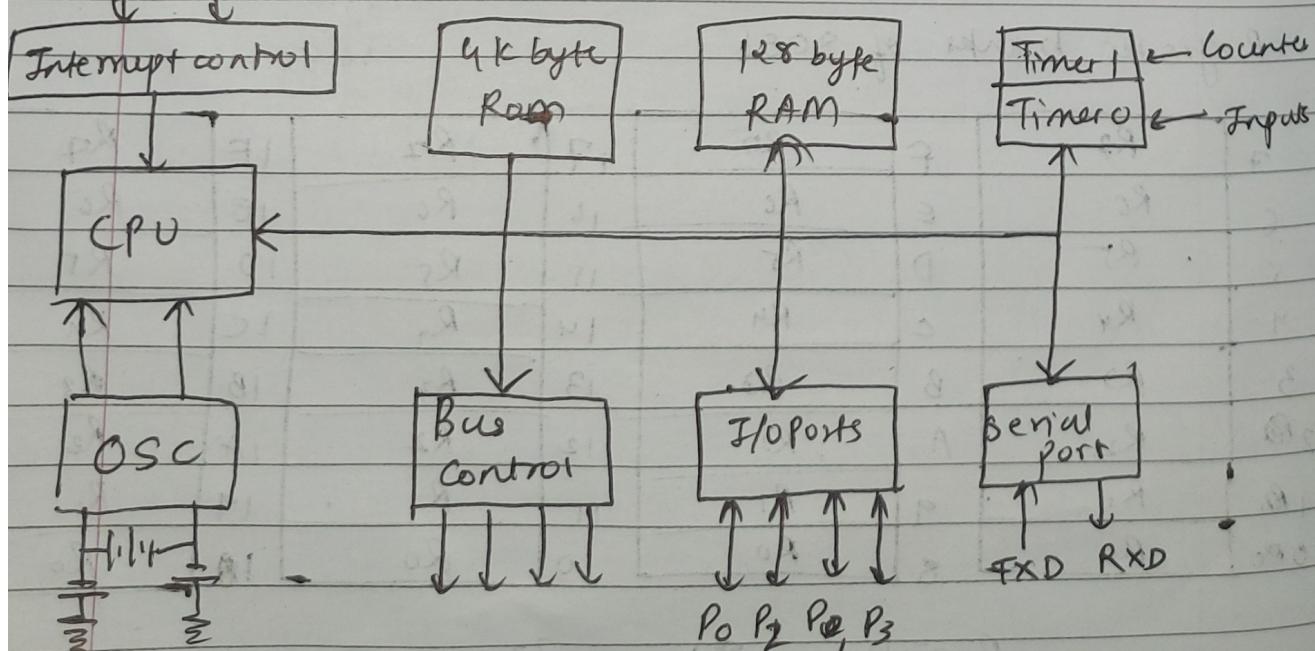
RS₁ - RS₀ - Select register

OV - overflow

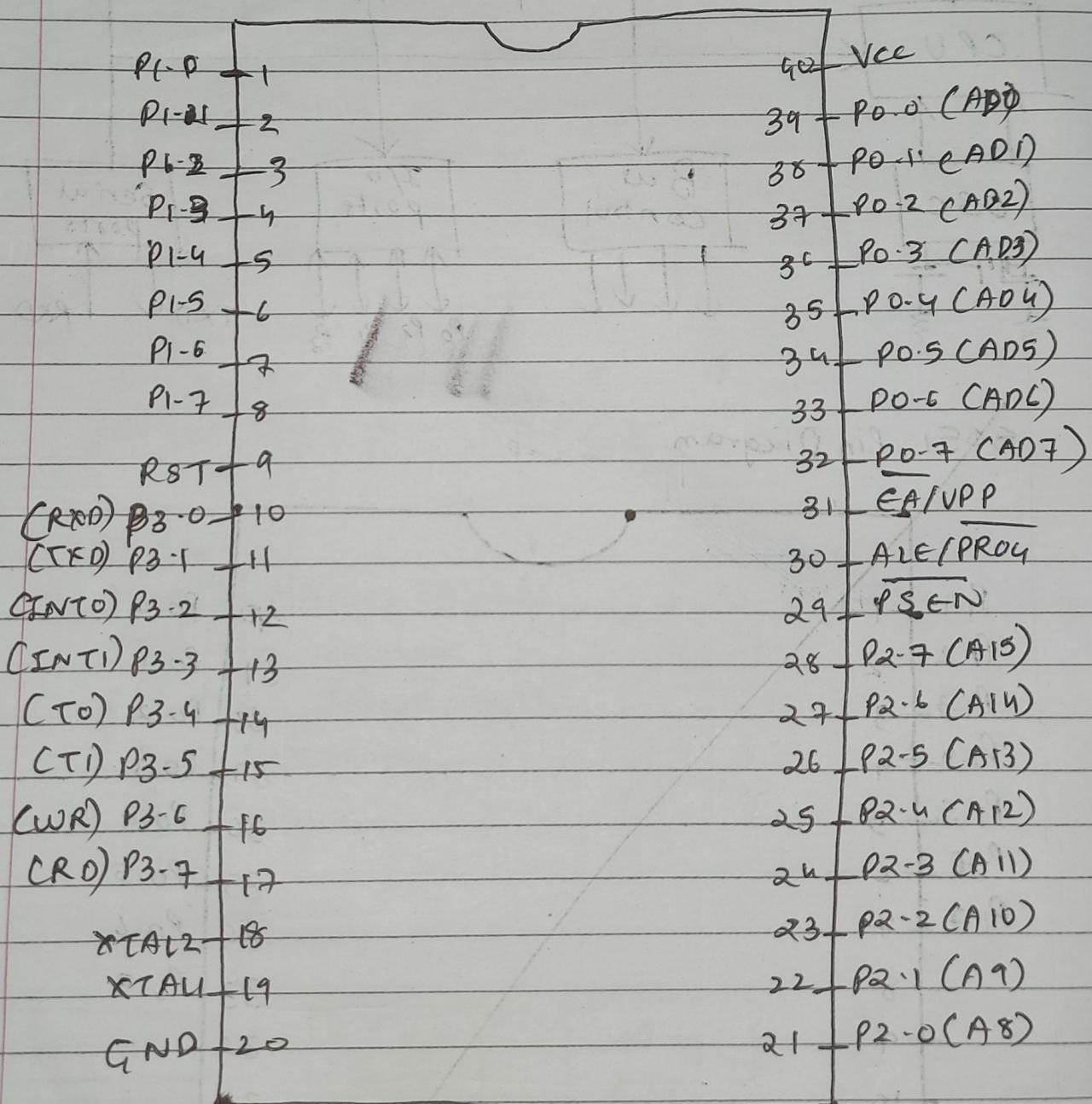
P - Parity

8051 Architecture

External interrupts

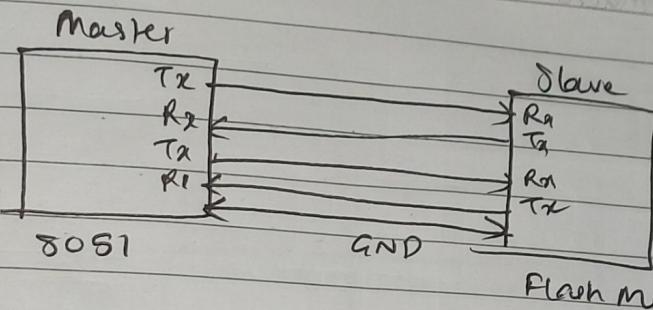


8051 Pin Diagram



UART

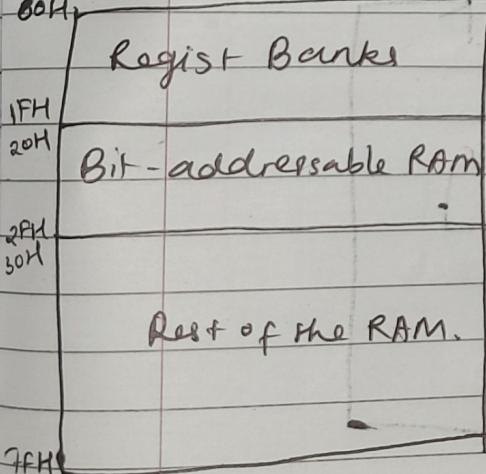
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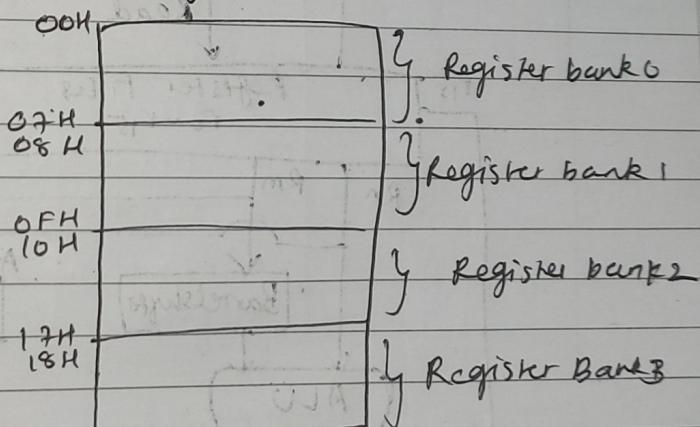
Receive → individual bytes

Send → individual bits

Memory org



Register bank Area



Register bank 0

Register bank 1

Register bank 2

Register bank 3

Register bank 4

Register bank 5

Register bank 6

Register bank 7

Register bank 8

Register bank 9

Register bank 10

Register bank 11

Register bank 12

Register bank 13

Register bank 14

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Register bank 243

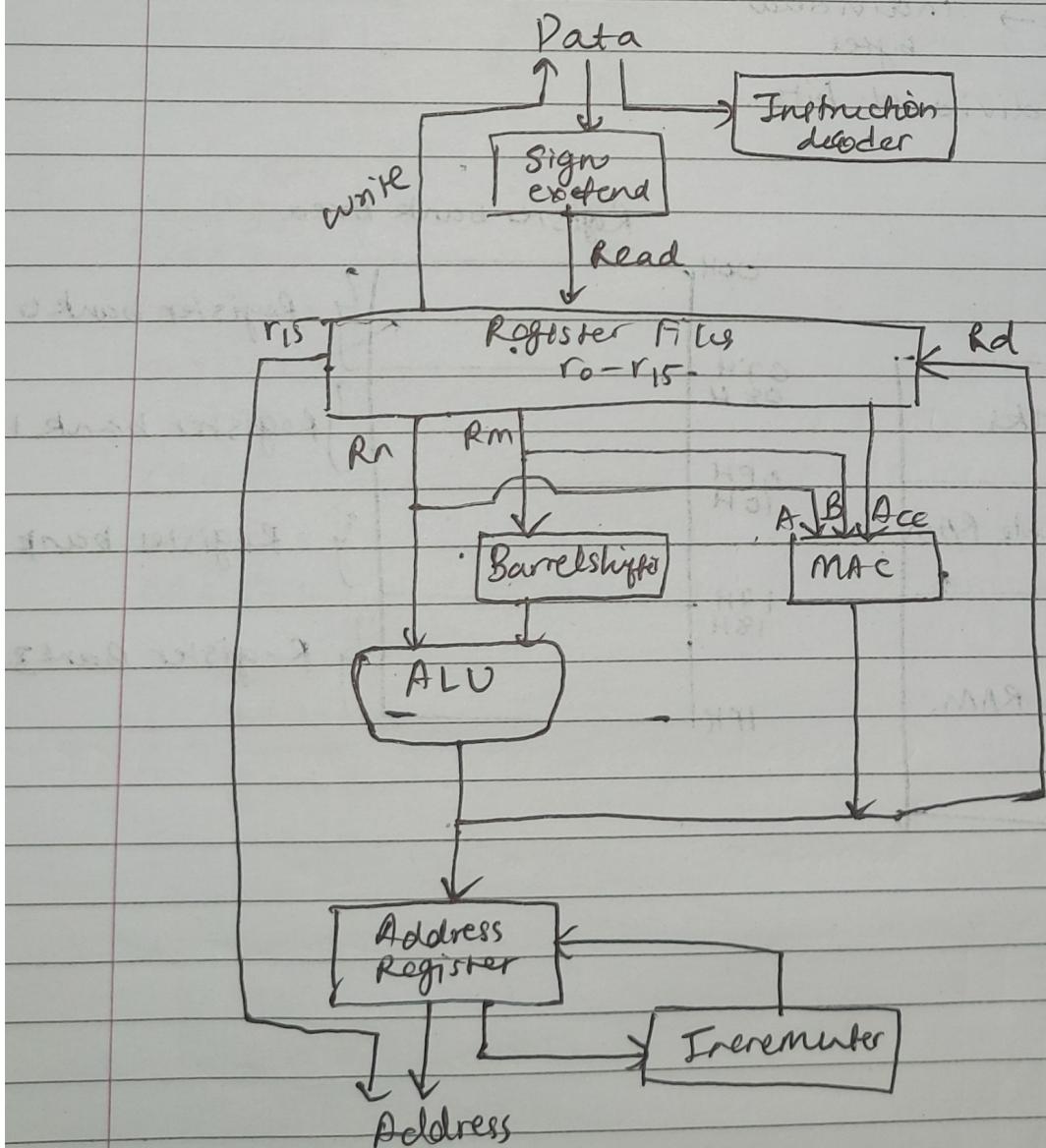
Register bank 244

Register bank 245

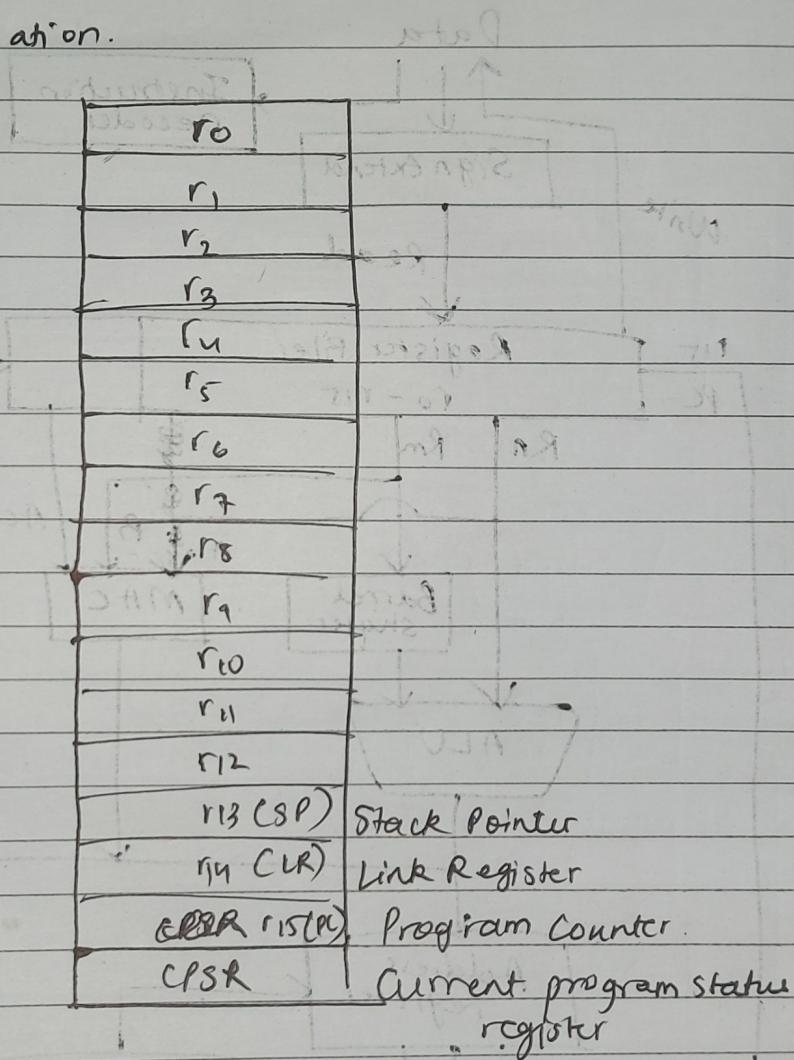
ARM (Advanced RISC machine)

- Microprocessor
- 32-bit architecture
- Von Neumann
- Load & Store

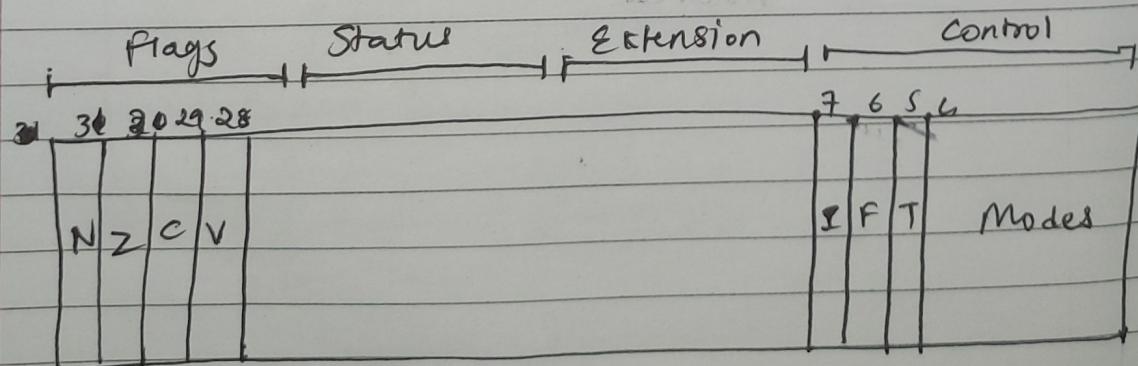
ARM architecture



Register Organisation.



CPSR (Current Program Status Register).



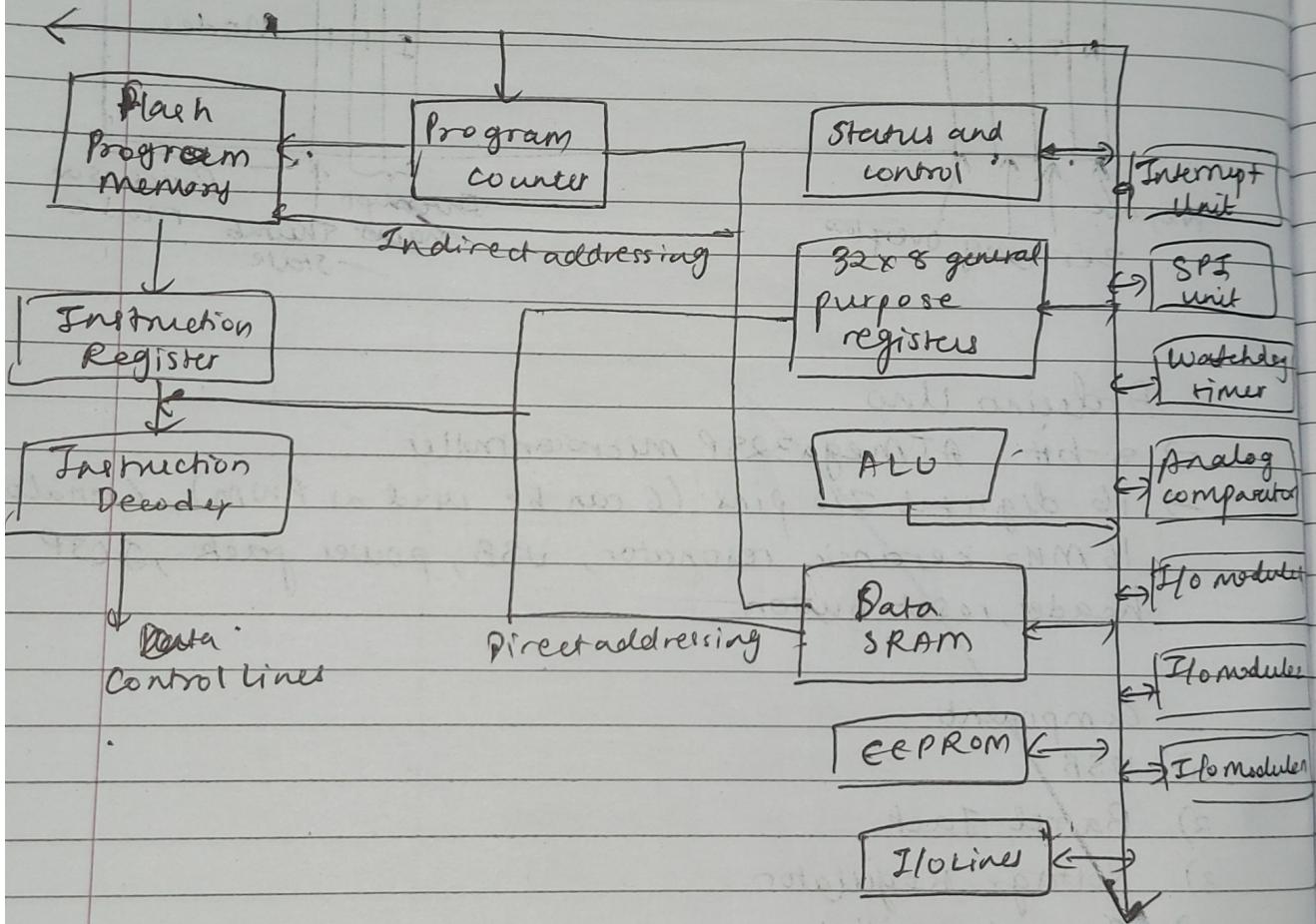
Arduino Uno

- 8-bit ATmega328P microcontroller
- 16 digital I/O pins (6 can be used as PWM), 6 analog, 16 MHz ceramic resonator, USB, power jack, ICSP header, reset button.

Components

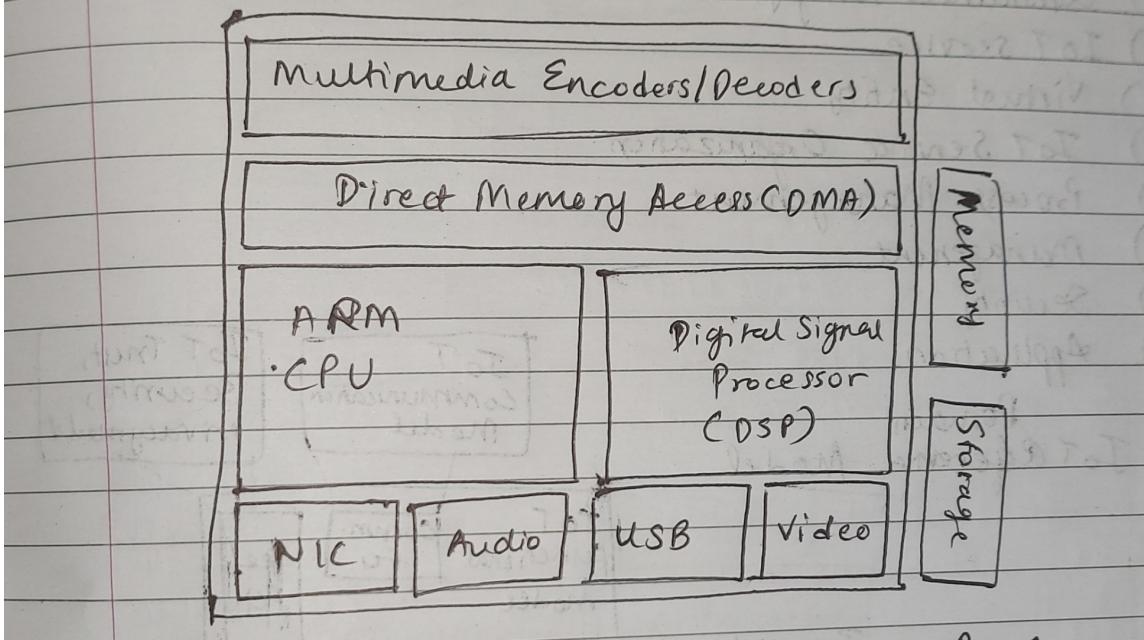
- 1) USB
- 2) Barrel Jack
- 3) Voltage Regulator
- 4) Crystal oscillator
- 5) Reset button, reset pin
- 6) +3.3V, +5V power supply output volt.
- 7) GND
- 8) Vin
- 9) Analog pins (A0-A5)
- 10) Main microcontroller
- 11) ICSP (In-circuit Serial programming)
- 12) LED
- 13) TX LED, RX LED
- 14) 14 Digital pins (6 are PWM providers)
- 15) AREF

Architecture of Arduino Uno



Raspberry Pi - SBC

Architecture of SoC



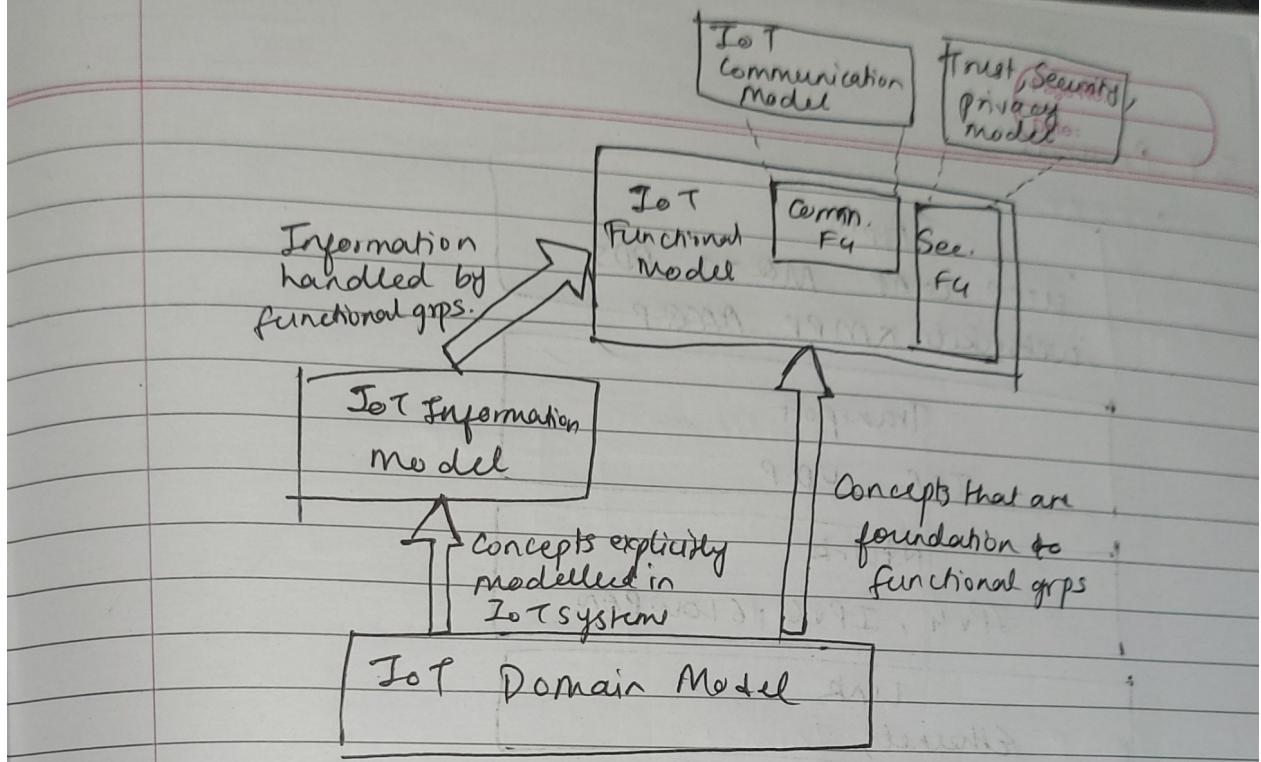
- 1) System on Chip
- 2) DSI Display Connector
- 3) GPIO
- 4) HDMI port
- 5) Ethernet port
- 6) USB port
- 7) Micro USB power connector
- 8) Audio port
- 9) USB & Ethernet interface chip
- 10) Camera connector

RWM

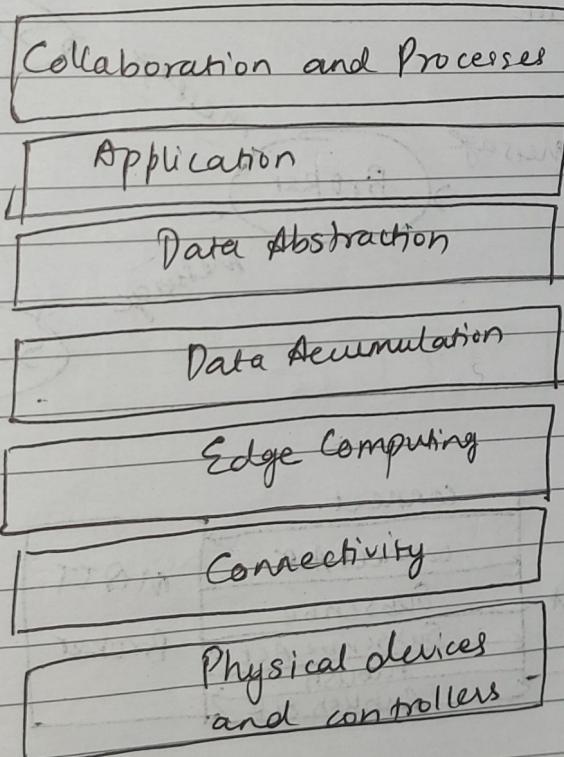
SPI

I2C

UART



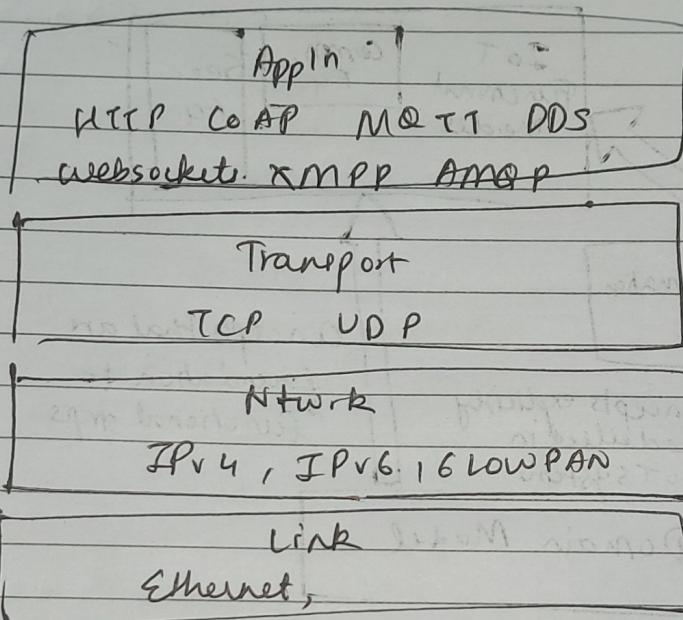
IoT Reference Model.



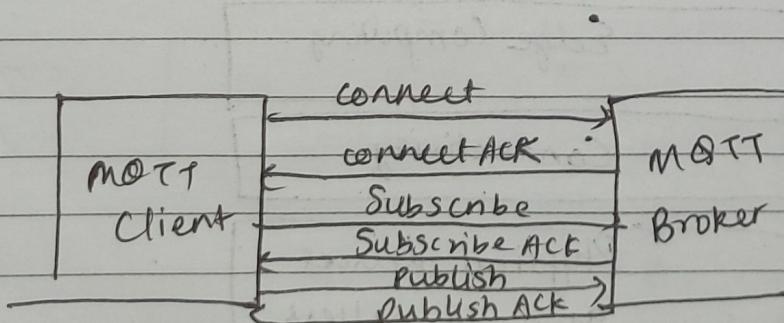
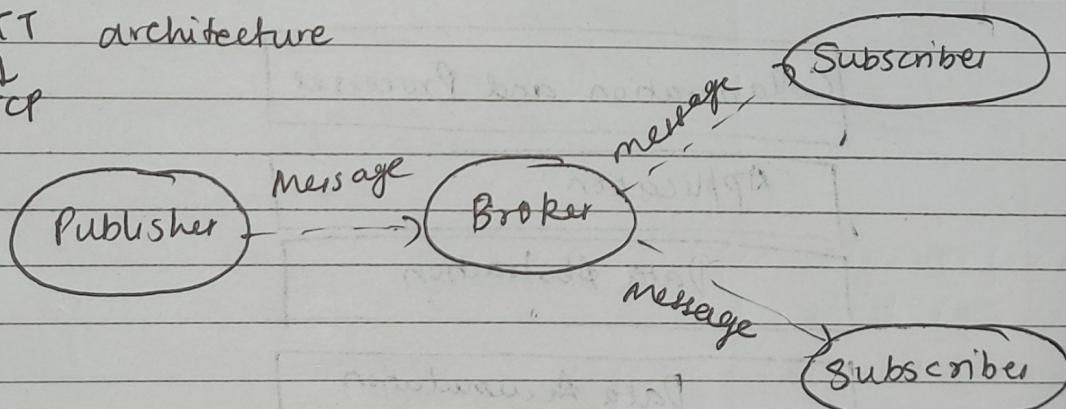
IoT Protocols

Page No.

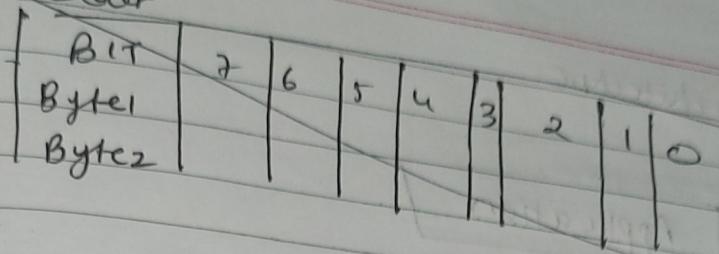
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MQTT architecture
Pub-Sub TCP

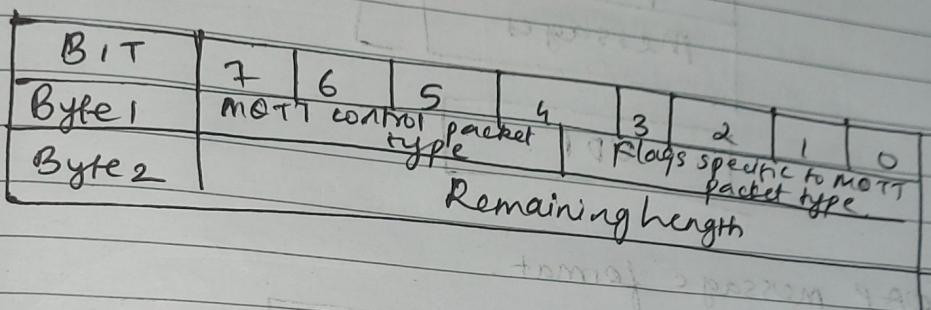


MQTT header



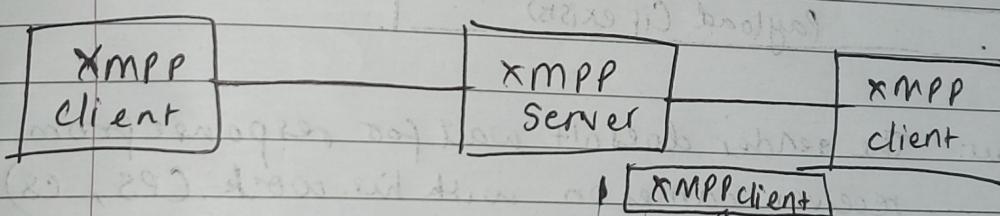
Page No.
Date:

MQTT header

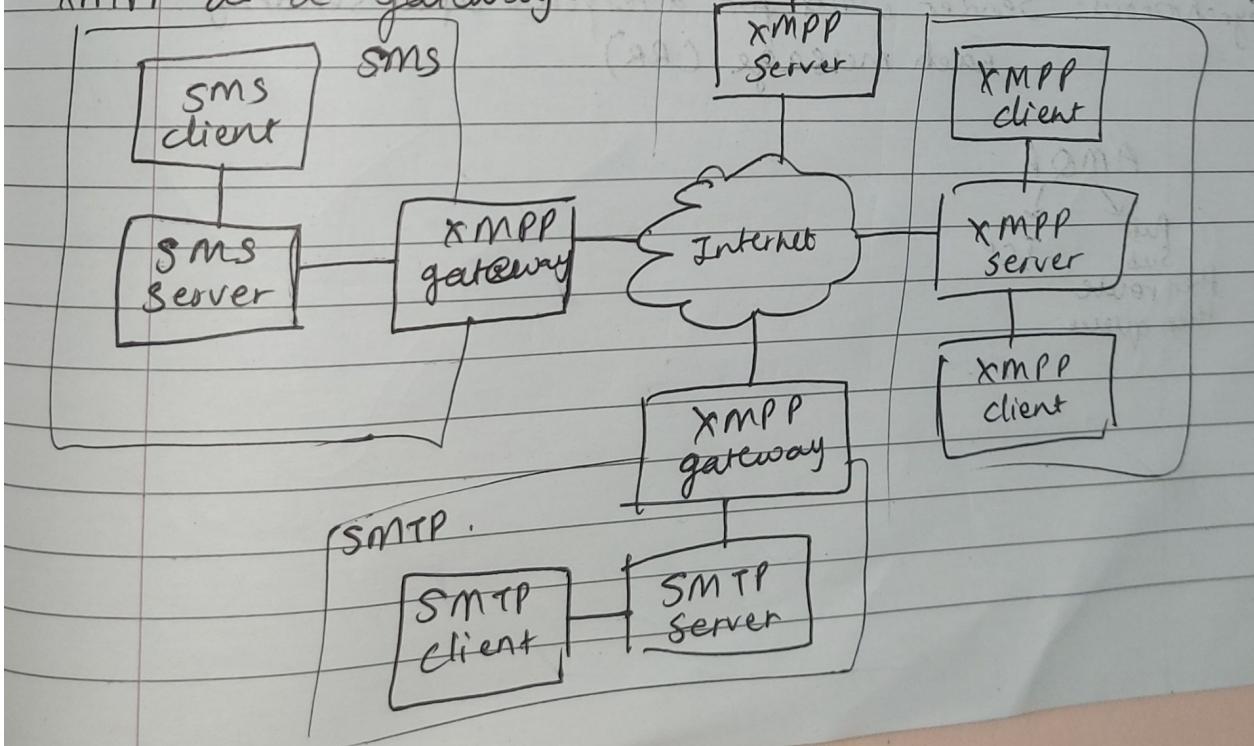


xmpp header architecture

client server



Xmpp as a gateway.

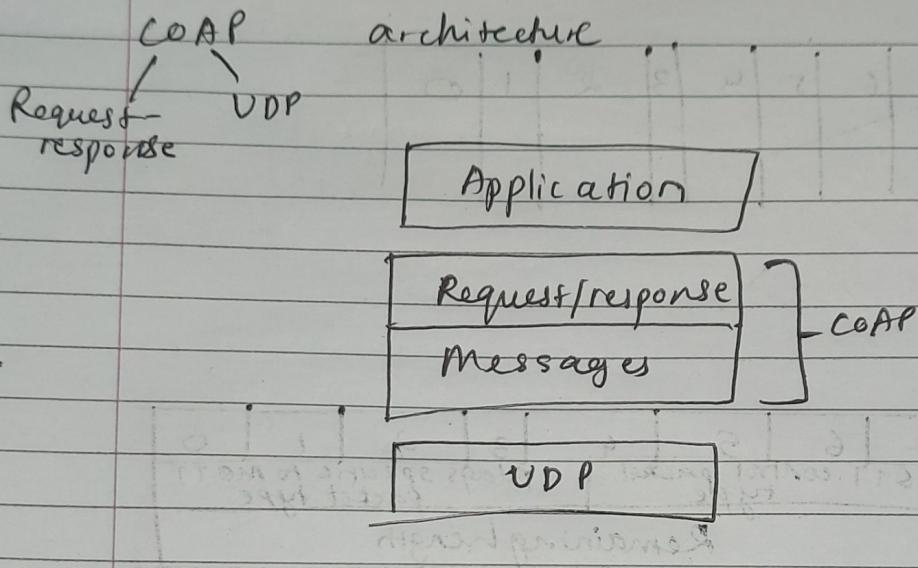


MQTT → TCP
AMQP

CoAP → UDP

Page No.

Date :



(COAP message format.

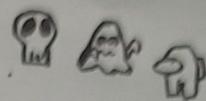
Ver	T	TKL	Code	MessageID
			Tokens...	
			Options (if exists)	
			Payload (if exists)	

Asynchronous: The sender doesn't wait for response from receiver carries on with his work. (P.S., C.S.)

Synchronous: Sender waits for a response after sending each message (RR)

AMQP
↓
Pub Sub
TCP
then route
then queue

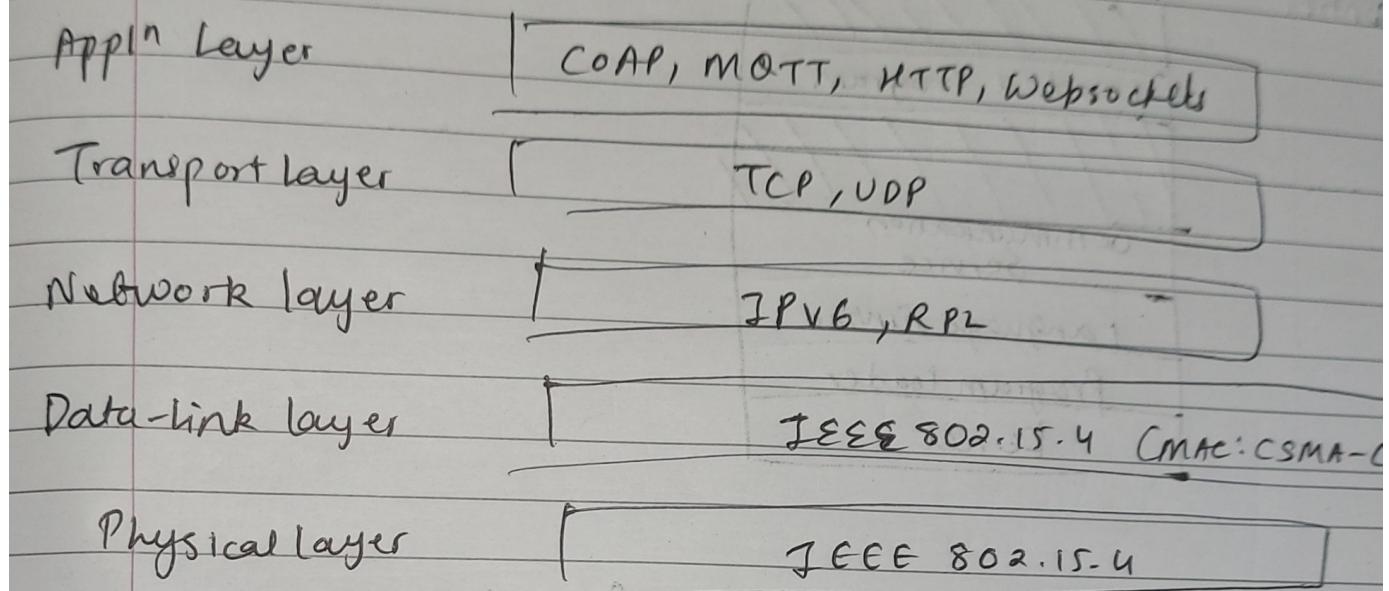
mesh topology



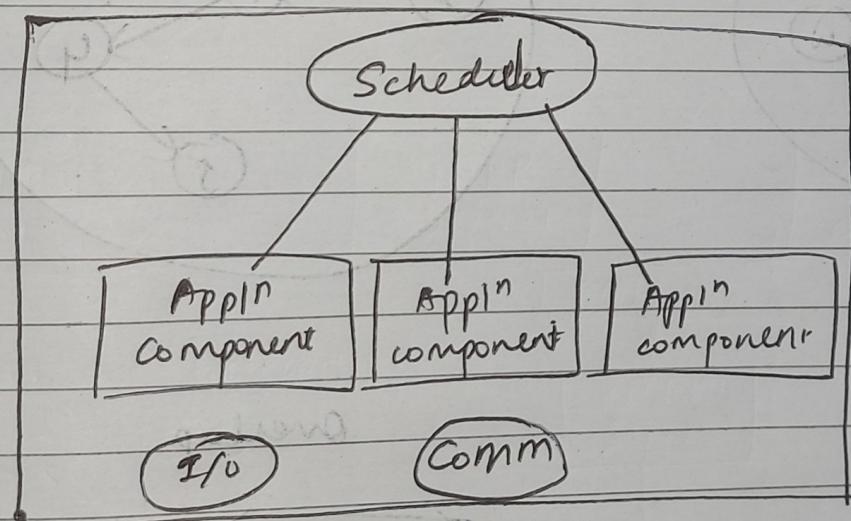
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Page No.
Date:

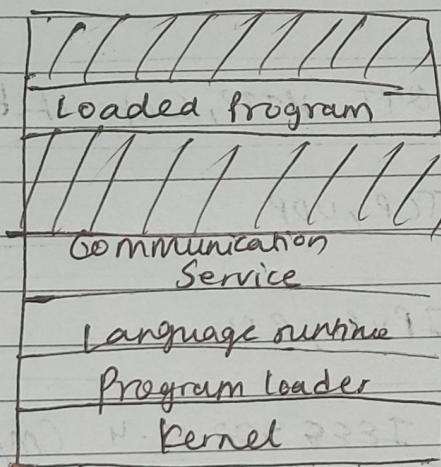
6 LOW-PAN protocol Stack



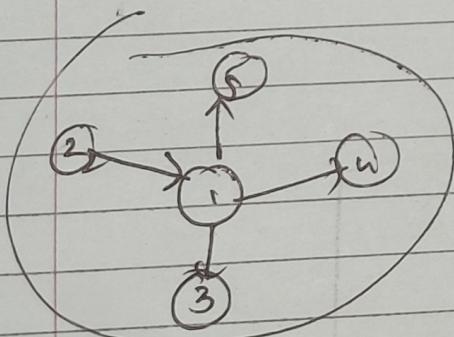
Tiny OS architecture.



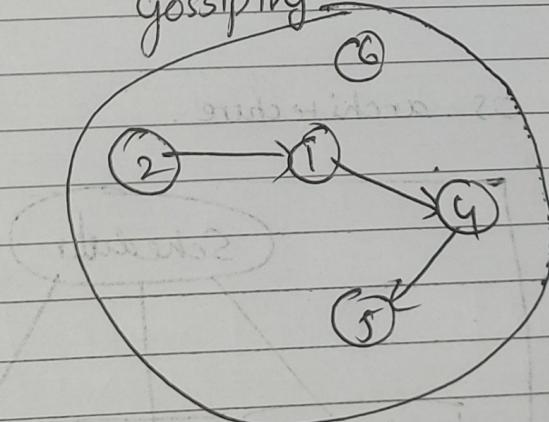
Contiki



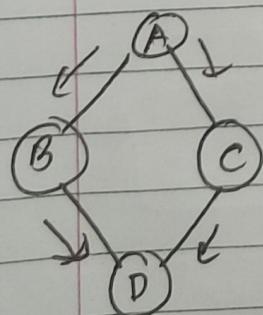
Flooding



Gossiping

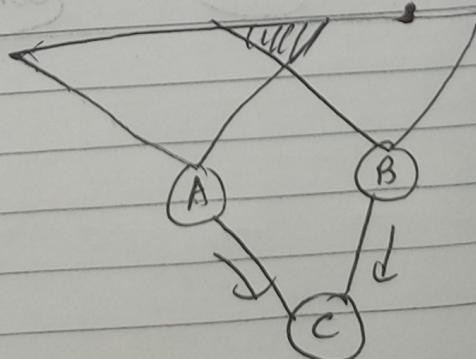


Impllosion



D receives 2 copies

Overlap



C receives 2 copies